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CONTROL CABIN OF A SPACESHIP

Most of the spaceship guidance will be done with the aid of large computers on Earth, but small course corrections must be made by the Captain, who must also be able to take over with auxiliary equipment in an emergency. The Lunar landing will probably be made with an automatic radar device, which will show the terrain on the TV screen as the rocket approaches the surface. The crew must check their instruments at every stage to be certain that all is functioning properly.

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ROCKET RANGE INSTRUMENTATION

A rocket not only transmits back information during its flight by radio but is also itself tracked by the optical and radio ground stations. In this way the maximum possible information about each flight is obtained, even though the rocket itself may be destroyed. Accurate tracking is also essential in case the rocket veers off course and endangers innocent people. In such an event the ground computers can show this immediately and enable the rocket to be destroyed before any damage is done.

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BOOSTER SEPARATING ABOVE THE EARTH

The first stage of a rocket is generally called the *booster*. When the booster rockets have exhausted their propellant, they drop away and the next stage of the missile begins to fire. Sometimes the booster rockets are recovered with the aid of parachutes, but in the case of artificial satellite rockets they may be moving so fast that the parachutes cannot slow them up sufficiently and they are destroyed in the air or fall into the ocean.

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HOW A ROCKET WORKS
(Liquid-Propellant)

The Fuel and Oxygen supply (*i.e.*, the *propellants*) are pumped into the combustion chamber and ignited. Hot gases escape easily through the exhaust but the pressure on the opposite side forces the rocket in that direction. This is an example of Newton's Third Law of Motion (that action and reaction are always equal and opposite). Another example is in the recoil of a gun.

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BUILDING A MANNED SPACESTATION

Within the next twenty years manned spacestations will be built to circle the Earth and provide scientific laboratories where experiments can be carried out which are impossible on Earth. They will be built up from the parts of rockets which have been flown up to rendezvous in space. They could be quite big but flimsy structures, for they would not need the strength required on earth as there would be no gravity to contend with.

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ABSENCE OF GRAVITY

We feel "weight" only when we are supported against gravity—e.g., when we stand on the ground. In a rapidly-descending lift we are momentarily "weightless." These conditions can be made to last for several seconds in a fast-flying aircraft, and when this happens the pilot and crew can float from their seats and even turn upside down. Weightless conditions would exist throughout a space journey, except when the rocket motors were firing.

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HIGH-ALTITUDE FLYING SUIT

Present-day high-flying aircraft venture to the borders of space, for at a height of only 20 miles no less than 99% of the mass of the Earth's air lies below. Consequently, pilots of such aircraft have to wear special high-altitude pressure suits, which are continually being improved to make them more like actual spacesuits. Rocket-propelled aircraft will shortly venture 100 miles or more above the Earth's surface, and then they will be in complete space.

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BRITISH ARTIFICIAL SATELLITE PROJECT

In September 1951 a design-study for a British artificial satellite was proposed by three engineer-members of the British Interplanetary Society. It was to be launched by a three-stage rocket and designed to include either a small payload of instruments or an inflatable metal-foil balloon into an orbit around the Earth. This design-study was found of great value by Professor Singer for his MOUSE project, and was also used in the initial planning stages of the VANGUARD project.

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PROBE ROCKET APPROACHING VENUS

An unmanned rocket approaches to survey cloud-laden Venus. Radio pulses try to penetrate the dense atmosphere and chart the surface. The probe rocket will circle the planet for some time on this work. Later, an unmanned rocket will be launched by a mother ship to penetrate deep into the atmosphere and try to land, and eventually a robot tank will emerge from it to crawl over the surface and extend our knowledge as much as possible before men can come.

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APPROACHING THE MOON

The rocket fires its motors to slow down and splays out its landing legs to withstand the final jar of landing. Wings are of no use as the Moon has no air, so the rocket must land with its jet and shock-absorbers in exactly the same way as it was originally launched. Inside the control cabin the radar computer automatically adjusts the thrust to bring the rocket to rest just above the Lunar surface, while the crew watch the TV screen as the jagged, rocky surface comes closer.

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